Ex obſervationibus autem ſecunda et quarta *Martii* habitis certo conſtat, cometam die tertia *Martii* circa horam ſextam matutinam ad æquatorem pertigiſſe, eumque tranſiviſſe in aſcenſione recta 282° 30′, cum inclinatione ſuæ ad æquatorem ſemitæ 84° 30′ quam proximè; adeoque tum obtinuiſſe longitudinem 13° 35′ in ♑, cum latitudine boreali 22° 54′. Exinde etiam colligere eſt, eandem ſemitam cometicam (quæ apparentiæ decurſu a circulo maximo haud deviaſſe viſa eſt) occurriſſe eclipticæ quidem in ♑ et ♋ 9° 19′ cum inclinatione 80 omnino graduum. Coluro verò æquinoctiorum in diſtantia 5° 37′½ a polis mundi verſus puncta æquinoctialia, cum angulo inclinationis 77° 33′½: Coluro demum ſolſtitiorum in diſtantia 23° 57′⅓ a polis mundi, verſus puncta ſolſtitialia cum angulo inclinationis 13° 38′ æquali maximæ elongationi orbitæ ab eodem coluro in parte averſa, ac diſtantiæ polorum orbitæ a punctis æquinoctialibus.

III. *Of the various* Genera *and* Species *of* Muſic *among the* Ancients, *with ſome* Obſervations *concerning their* Scale; *in a Letter from* John Chriſtoph. Pepuſch, *Muſic. D. & F.R.S. to Mr.* Abraham de Moivre, *F. R. S.*

S I R,

Read Nov 13. 1746. *here printed with Alterations.*

IN Compliance with your Requeſt, I here ſend you ſome of my Thoughts on the various *Genera* and *Species* of the *Greek* Muſic,

ſic. What they were, and how far the Doctrine of the Ancients in this reſpect is reconcileable with the true Nature of muſical Sounds, are, you know, Queſtions which have not a little perplexed the Learned.

That muſical Intervals are founded on certain *Ratio's* or Proportions expreſſible in Numbers, is an old Diſcovery. Nobody is better acquainted with theſe Proportions than yourſelf; and I am not a little obliged to you for the Light you have herein given me. It is well known, that all muſical *Ratio's* may be analyſed into the prime Numbers 2, 3, and 5; and that all Intervals may be found from the Octave, Fifth and Third *Major*; which reſpectively correſpond to thoſe Numbers. Theſe are the Muſicians Elements, from the various Combinations of which all the agreeable Variety of Relations of Sounds reſult. This Syſtem is ſo well founded on Experience, that we may look upon it as the Standard of Truth. Every Interval that occurs in Muſic is good or bad, as it approaches to, or deviates from, what it ought to be on theſe Principles. The Doctrine of ſome of the Ancients ſeems different. Whoever looks into the Numbers given us by *Ptolemy*, will not only find the Primes 2, 3, and 5, but 7, 11, *&c.* introduced. Nay he ſeems to think all Fourths good, provided their component Intervals may be expreſſed by ſuperparticular *Ratio's*. But theſe are juſtly exploded Conceits; and it ſeems not improbable, that the Contradictions of different numerical Hypotheſes, even in the Age of *Ariſtoxenus*, and their Inconſiſtency with Experience, might lead him to reject their Numbers altogether. It is Pity he did: Had he made a proper Uſe of them, we ſhould have had a clearer Inſight into the Muſic of his Times. However, what remains of the Writings of this great Muſician, joined to my own Obſervation and Experience, has enabled me, I hope, to throw ſome Light upon the obſcure Subject of the ancient Species of Muſic.

By the Manner in which *Euclid* and others find the Notes of their Scale, it muſt have been compoſed of Tones *Major*, and *Limma's*. Hence the ſeven Intervals of one Octave would be thus expreſſed in Numbers, $\frac{9}{8}$, $\frac{256}{243}$, $\frac{9}{8}$, $\frac{9}{8}$, $\frac{256}{243}$, $\frac{9}{8}$, $\frac{9}{8}$.

Some modern Authors have from this inferred the Imperfection of the *Greek* Muſic. They alledge we here find the *Ditonus*, or an Interval equal to two Tones *Major* expreſſed by $\frac{81}{64}$, inſtead of the true Third *Major* expreſſed by $\frac{5}{4}$. As there can be no Queſtion of the Beauty and Elegance of the latter, the former therefore muſt be out of Tune, and out of Tune by a whole Comma, which is very ſhocking to the Ear. In like manner the Trihemitone of the Ancients falls ſhort of the third *Minor* by a Comma; which is alſo the Deficiency of their Hemitone or *Limma*, from the true Semitone *Major*, ſo eſſential to good Melody. Theſe Errors would make their Scale appear much out of Tune to us. This I readily grant; and add, that it appeared out of Tune to them; ſince they expreſly tell us, that the Intervals leſs than the *Diateſſaron* or Fourth, as alſo the Intervals between the Fifth and Octave were diſſonant and diſagreeable to the Ear. Their Scale, which has been called by ſome the *Scala maxima*, was not intended to form the Voice to ſing accurately, but was deſigned to repreſent the Syſtem of their Modes and Tones, and to give the true Fourths and

and Fifths of every Key a Compoſer might chooſe. Now if, inſtead of Tones *Major* and *Limma's*, we take the Tones *Major* and *Minor*, with the Semitone *Major*, as the Moderns contend we ſhould, we ſhall have a good Scale indeed, but a Scale adapted only to the concinnous Conſtitution of one Key; and whenever we proceed from that into another, we find ſome Fourth or Fifth erroneous by a Comma. This the Ancients did not admit of. If, to diminiſh ſuch Errors, we introduce a Temperature, we ſhall have nothing in Tune but the Octave. We ſee then the Scale of the Ancients was not deſtitute of Reaſon; and that no good Argument againſt the Accuracy of their Practice can from thence be formed.

It was uſual among the *Greeks* to conſider a deſcending as well as an aſcending Scale; the former proceeding from acute to grave, preciſely by the ſame Intervals as the latter did from grave to acute. The firſt Sound in each was the *Proslambanomenos*. The not diſtinguiſhing theſe two Scales has led ſeveral learned Moderns to ſuppoſe, that the *Greeks*, in ſome Centuries, took the *Proslambanomenos* to be the loweſt Note in their Syſtem; and, in other Centuries, to be the higheſt. But the Truth of the Matter is, that the *Proslambanomenos* was the loweſt, or higheſt Note, according as they conſidered the aſcending, or deſcending Scale. The Diſtinction of theſe is conducive to the Variety and Perfection of Melody; but I never yet met with above one Piece of Muſic, where the Compoſer appeared to have any Intelligence of this kind. The Compoſition is about 150, or more, Years old, for four Voices; and the Words are, *Vobis datum eſt noſcere Myſterium regni Dei, cæteris autem* *in Parabolis*; *ut videntes non videant, et audientes non intelligant.* By the Choice of the Words, the Author ſeems to allude to his having performed ſomething not commonly underſtood.

I ſhall here give you an Octave only of the aſcending and deſcending Scales of the diatonic *Genus* of the Ancients, with the Names for their ſeveral Sounds, as alſo the correſponding modern Letters.

	Aſcending.		Deſcending.	
A		Proslambanomenos		*g*
	$\frac{9}{8}$		$\frac{8}{9}$	
B		Hypate Hypaton		*f*
	$\frac{256}{243}$		$\frac{243}{256}$	
C		Parhypate Hypaton		*e*
	$\frac{9}{8}$		$\frac{8}{9}$	
D		Lychanos Hypaton		*d*
	$\frac{9}{8}$		$\frac{8}{9}$	
E		Hypate Meſon		*c*
	$\frac{256}{243}$		$\frac{243}{256}$	
F		Parhypate Meſon		*b*
	$\frac{9}{8}$		$\frac{8}{9}$	
G		Lychanos Meſon		*a*
	$\frac{9}{8}$		$\frac{8}{9}$	
a		Meſe		*G*

Where you ſee the ſame *Greek* Names ſerve for the Sounds in the aſcending and deſcending Scales.

In the Octave here given, four Sounds, *viz.* the *Proslambanomenos*, *Hypate Hypaton*, *Hypate Meſon*, and *Meſe*, were called *Stabiles*, from their remaining fixed throughout all the *Genera* and *Species*.

The other four Sounds being the *Parhypate Hypaton*, *Lychanos Hypaton*, *Parhypate Meſon*, and the *Lychanos*

Lychanos Meſon, were called *Mobiles*, becauſe they varied according to the different Species and Varieties of Muſic.

I come now to determine the Queſtion, What theſe different *Genera* and *Species* were. You know, that by *Genus* and *Species* was underſtood a Diviſion of the *Diateſſaron*, containing four Sounds, into three Intervals. The *Greeks* conſtituted three *Genera*, known by the Names of *enharmonic*, *chromatic*, and *diatonic*. The *chromatic* was ſubdivided into three Species, and the *diatonic* into two. The three *chromatic* Species were the *Chromaticum molle*, the *Seſquialterum*, and the *Toniæum*. The two *diatonic* Species were the *Diatonicum molle*, and the *Intenſum*; ſo that they had ſix Species in all. Some of theſe are in Uſe among the Moderns, but others are as yet unknown in Theory or Practice.

I now proceed to define all theſe Species, by determining the Intervals, of which they ſeverally conſiſted; beginning by the *Diatonicum intenſum*, as the moſt eaſy and familiar.

The *Diatonicum intenſum* was compoſed of two Tones, and a Semitone: But, to ſpeak exactly, it conſiſts of a Semitone *Major*, a Tone *Minor*, and a Tone *Major*. This is in daily Practice; and we find it accurately defined by *Didymus*, in *Ptolemy's Harmonics* publiſhed by Dr. *Wallis*.

The next Species is the *Diatonicum molle*, as yet undiſcovered, as far as appears to me, by any modern Author. Its component Intervals are, the Semitone *Major*, an Interval compoſed of two Semitones *Minor*, and the Complement of theſe two to the fourth, being

being an Interval equal to a Tone *Major*, and an *enharmonic Dieſis*.

The third Species is the *Chromaticum Toniæum*. Its component Intervals are, a Semitone *Major*, ſucceeded by another Semitone *Major*; and, laſtly, the Complement of theſe two to the fourth, commonly called a ſuperfluous Tone.

The fourth Species is the *Chromaticum Seſquialterum*, which is conſtituted by the Progreſſion of a Semitone *Major*, a Semitone *Minor*, and a Third *Minor*. This is mentioned by *Ptolemy*, as the *Chromatic* of *Didymus*. Examples among the Moderns are frequent.

The fifth Species is the *Chromaticum molle*. Its Intervals are two ſubſequent Semitones *Minor*, and the Complements of theſe two to the fourth; that is, an Interval compounded of a Third *Minor*, and an *enharmonic Dieſis*. This Species I never met with among the Moderns.

The ſixth and laſt Species is the *enharmonic*. *Salinas* and others have determined this accurately. Its Intervals are, the Semitone *Minor*, the *enharmonica*, *Dieſis* and the Third *Major*.

Examples of four of theſe Species may be found in modern Practice. But I do not know of any Theoriſt who ever yet determined what the *Chromaticum Toniæum* of the Ancients was: Nor have any of them perceived the Analogy between the *Chromaticum Seſquialterum* and our modern *Chromatic*. The *Enharmonic*, ſo much admired by the Ancients, has been little in Uſe among our Muſicians as yet. As to the *Diatonicum intenſum*, it is too obvious to be miſtaken.

Ariſtoxenus and others often mention the Tone as divided into four Parts, and the Semitone into two; thereby making ten Diviſions or *Dieſes* in the fourth. And this is true, if we conſider theſe Sounds in one Tenſion; that is, either aſcending or deſcending: But, accurately ſpeaking, when we conſider all the *Dieſes* or Diviſions of the fourth, both aſcending and deſcending, we ſhall find thirteen; five to each Tone, and three to the Semitone *Major*. But then it is to be obſerved, that ſome of theſe Diviſions will be leſs than the *enharmonic Dieſis*: For, if we divide the Semitone *Major* into the Semitone *Minor*, and *enharmonic Dieſis*, aſcending, for Inſtance, *E*, ※*E*, *F*, and then divide in like manner deſcending, *F*, ♭*F*, *E*, we ſhall have the Semitone *Major* divided into three Parts thus, *E*, ♭*F*, ※*E*, *F*; where the Interval between ♭*F* and ※*E* is leſs than the *enharmonic Dieſis* between *E* and ♭*F*, and between ※*E* and *F*, as is eaſily proved.

Now, if we ſuppoſe theſe ſmall Intervals equal, by increaſing the leaſt Diviſion, and diminiſhing the true *enharmonic Dieſis*, we ſhall then have a fourth divided into thirteen equal Parts; and, conſequently, the Octave divided into three ſuch equal Parts; which gives us the celebrated Temperature of *Huygens*, the moſt perfect of all.

From this it appears, that the Diviſion of the Octave into 31 Parts, was neceſſarily implied in the Doctrine of the Ancients. The firſt of the Moderns who mentioned ſuch a Diviſion was Don *Vincentino*, in his Book intitled *L'Antica Muſica ridotta alla moderna Prattica*, printed at *Rome*, 1555. *folio*. An Inſtrument had been made according to his Notion; which was condemned by *Zarlino* and *Salinas*, with-out ſufficient Reaſon. But Mr. *Huygens*, having more accurately examined the Matter, found it to be the beſt Temperature that could be contrived. Tho' neither this great Mathematician, nor *Zarlino, Salinas*, nor even Don *Vincentino*, ſeem to have had a diſtinct Notion of all theſe thirty-one Intervals, nor of their Names, nor of their Neceſſity to the Perfection of Muſic.

I muſt obſerve to you, that I received, ſome time ago, a Manuſcript from *Florence*, where a Muſician of that City had rightly named theſe Intervals of the Octave. I found their Names, you know, many Years ago.

In *Huygens*'s Temperature the Tones are all equal: But, in a true and accurate Practice of Singing, they are not ſo. And I muſt add, that the Tone divided in every Species muſt be the Tone *Minor*; for the Diviſion of the Tone *Major* is harſh and inelegant. So that, in the Diviſion of the fourth, it is to be obſerved, that in every Species, the Tone *Major* muſt either be an undivided Interval, or make Part of one.

You may perhaps wonder how the foregoing Doctrine can be found in the Writings of the Ancients, ſince the Diſtinction of Tones into *Major* and *Minor* is no where mention'd in their Writings. But it is to be obſerved, that though the Terms do not occur, yet the Thing itſelf was not unknown to them. I own, they have not expreſſed themſelves fully; yet, from the Whole of their Writings come to our Hands, I think the Doctrine before laid down may be well ſupported. But, as it would require ſome time to put this in a juſt Light, I muſt defer it to another Opportunity.

I am, *&c.*

IV.